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## VII.

ON MARTIN BEHAIM'S GLOBE, AND HIS INFLUENCE  
UPON GEOGRAPHICAL SCIENCE.

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BY REV. MYTTON MAURY.

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As early as the first half of the twelfth century the city of Nuremberg had attained a position of importance among the cities of Central Europe. Her internal commerce was prodigious. In her relations to the East India trade she might be called an inland Venice. To her mart flocked merchants and traders from the surrounding region to supply themselves with the costly products of the distant East. Here were consigned silks and shawls of exquisite texture, wrought by the deft and delicate hands of the children of the sun—jewels from Golconda's mines—spices that grew by Ganges' stream; and from her teeming magazines these articles of Oriental luxury were dispensed to enhance the comfort and gratify the taste of the barbarians of the west.

The tolls that are levied at her gates make her revenue more than regal: magnificent churches arise, their shrines embellished with the costliest gems of art; palaces literally crown her well-stored warehouses; wealth multiplies; power grows. Six thousand warriors are equipped by her citizens to serve in the Imperial armies. Once and again she is deemed worthy the presence of the national Diet. Laws for the empire issue from the market-town.

Prominent among the merchant-princes who contributed to the prosperity of this commercial metropolis, we find

the family of Behaim. Originally from Bohemia, as their name imports, they had been driven thence by religious persecution, and found refuge in a city large-minded and large-hearted, where divergence from ecclesiastical orthodoxy was deemed a less flagrant enormity than divergence from practical honesty, and where it was not considered an essential part of the service of God to augment the annual death-rate by the concremation of heretics. Here the Behaims attained no inconsiderable wealth, and maintained a position of high regard in the community.

The acquisition of money, however, is not the solitary object whereon the family concentrates its energy.\* To members of a modern geographical society, such as I now have the honor of addressing, one of the Behaims, who lived in the second half of the fifteenth century, and was glorified by the name of Martin, is a personage of singular interest.

In the first place, he furnishes us with authoritative data for ascertaining the condition of geographical science in his day. Among the archives of the family is preserved a token at once of Martin's regard for the city of his nativity, and of his own proficiency in geographical studies. The relic in question is a globe, representing the world as he and his contemporaries supposed it to be constituted. This Martin manufactured in 1492, and presented to the city of Nuremberg.

The map of the globe consists of papier-maché, over which is a crust of gypsum, and over this again parchment is stretched, upon which the drawing is executed. In size, this work of art alone was not imposing, its diameter being only about twenty inches. But it possessed, in the days of its youth, divers other attractions. With a degree of scepticism regarding the interest felt by

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\* Mathematically speaking, they may be said to have left the multiplication-table and advanced to the process of division—a stage not always reached by men of wealth.

the burgomasterial mind in geographical studies, Martin sought to popularize the somewhat hard features of Mother Earth by a *ruse* not altogether unknown to beautifiers of the present day. The old lady was gotten up right handsomely ; Neptune rejoiced in a domain of brilliant ultra-marine ; the lands were brown or green, according, we presume, to their supposed sterility or productiveness ; the snowy mountain-crests were of glistening white. The multitudinous and multifarious inscriptions, which render the globe a miniature gazetteer, were made to present a still more popular appearance. Gold and silver, red and yellow letters, impressed even the untutored eye with an idea of the inestimable value of the information imparted. Gabriel Nützel, Paul Volkamer, and Nicolaus Groland, the chief men of the imperial city, who, as Behaim informs us, in an inscription at the north pole of his globe, urged him to construct this elaborate monument of geographical science, must have congratulated themselves upon its goodly appearance.

Time, on the whole, has treated Martin's labor with not a little partiality. True, the gorgeous coloring hath somewhat lost her original glory ; the mellowness of antiquity supplants the lustre which bedazzled the eyes of our worthy burgomasters when the distinguished savant presented to their official body this fac-simile of Mother Earth.

But although the ocean of glorious ultramarine is converted into one immense black sea, and the gold hath lost its glittering identity, still the *lines* which show the supposed position and configuration of continents and islands are altogether intact ; and the several portions of land and sea retain their names. All is, therefore, preserved which serves in any way as an exponent of the general condition of geographical science in 1492.

We say general with some degree of emphasis ; for on examining the globe we find that its constructor represents himself as, in the main, a compiler ; and states that his

guides have been Ptolemy, Marco Polo, and Mandeville. And inasmuch as unwarranted assertions have been offered in regard to the geographical *discoveries* made by Behaim, it is as well explicitly to state that this is what he says himself.

While, therefore, the globe of Behaim is not to be taken as an index of its constructor's achievements in geographical discovery, it has extraordinary interest, considered as a fair exponent of the geographical knowledge possessed by himself and his contemporaries.

A glance will show us what this knowledge was, and will reveal the fact that, in some particulars of geographical detail, the darkness supposed to characterize the age of Behaim is more imaginary than real. It is true there is a large amount of romance intermixed with Behaim's incontestible facts.

In regard, for example, to the Island of Zanzibar, Martin borrows from Marco Polo some very poetical items. These are of the greatest interest to the physiologist, and serve also to illustrate in a very striking manner the intrepidity of the missionary to whose efforts the Zanzibarians owe their acquaintance with Christianity. The reverend adventurer, seated conveniently upon the apex of one of their mountains, is encouraging the idolaters at its base to unite with him in prayer. His must needs have been an heroic soul; for his auditors, we are assured, have four times the strength of Europeans, are glorified with great long ears, wide mouths, and appalling eyes, and have hands four times the size of those of ordinary mortals.

Pliny lends a charm to the dry details of geographical fact by supplying our cosmographer with illustrations of the natural history of the globe. Some of the specimens depicted, if judged by zoölogical adepts of the present day to be somewhat difficult to classify with species now recognized, are nevertheless strikingly picturesque. Not far from the equator, mermaids, with golden tresses

and azure eyes, are floating tranquilly upon the waters ; in their neighborhood appears a sea-lion, which, with a locomotive apparatus but poorly calculated to give his very terrestrial carcass support upon the briny surface, nevertheless heroically maintains his position ; while not very far hence a sea-horse, half submerged, is endeavoring to effect a landing at Cape Verd. A small craft, heading for Antilia, seems threatened with demolition by a parti-colored sea-serpent ; while another specimen of more alarming mien is balancing himself upon the convolutions of his tail, a little to the south of the "circulus equinoccialis," and preparing to engulf one of Martin's inscriptions. Besides these are other variations from strict geographical fact, which readily appear on inspection.

With all its errors and defects, however, the globe of Behaim presents a large proportion of correct detail. We, of course, are nowhere. The place of the western continent is occupied by Cathay and adjoining provinces, supposed to be made up, in a large measure, of golden mountains and pearly strands. Setting aside this glaring omission, it is interesting to notice that Africa is represented as being circumnavigable. Importance attaches to this point, inasmuch as the globe was constructed as early as 1492, five years before Vasco de Gama had accomplished the passage to India *via* the Cape of Good Hope. Behaim had obtained his knowledge of this fact from ancient authorities. Phœnician navigators, in the service of Pharaoh Necho, King of Egypt, had circumnavigated this continent ; and Xerxes had given orders to one Sataspes to do the same thing. Failing to perform the king's behest, poor Sataspes was impaled, a calamity showing at once the inflexible rigidity of Persian laws, and the certainty felt by the king that the exploit in question could be achieved. Another point of very great interest is that Behaim, who was in Nuremberg, constructing his globe, at the very time at which

Columbus was making his first voyage, and before his return from that voyage, represents nothing in the shape of land larger than Cipango, or Japan, as intervening between Europe and Cathay. This at once involves in suspicion the idea that Columbus was in any sense the originator or exclusive possessor of the idea that steady westward sailing would bring one from Europe to the native country of pearls, gold, and frankincense.

I may perhaps be excused the momentary digression if I add that the suspicion thus suggested by the globe of Behaim is completely divested of all doubtful character by the celebrated letters of Toscanelli to Columbus. These bear date 1474, and contain directions as to the course which Columbus should pursue.

To resume, however, our proper subject. Not alone does Behaim commend himself to our regard as one who was in possession of all the best geographical knowledge of his day. He was not a mere compiler, but indirectly and directly a producer. First let us see how, in an indirect manner, he contributed to enlarge the field of geographical science.

Conspicuous among the extraordinary men of the world figured one, in the fifteenth century, named Müller, and designated, by the piety of his parents, John. Born at Königsberg, or King's Mountain, his is commonly known by a Latin adjective, which commemorates this fact, Regiomontanus.

John of Königsberg (to turn him into respectable English) was one of those mediæval personages who rescue their age from the obnoxious epithet dark. He was a star of no mean magnitude in the intellectual heavens. In the department of mathematical science he may not unfairly be ranked with Des Cartes and Newton. He clearly saw that an absolute prerequisite in his day, for the advancement of scientific investigation, was greater accuracy in the instruments employed.

Those very respectable heretics, the Arabians, had, it

is true, reached some degree of excellence in this line. Among the sins of which they were guilty, during their domination in Europe, was not that of contemning or thwarting scientific pursuits. It appears in the highest degree probable that they made the Castilians acquainted with the use of an instrument called the astrolabe, or star-catcher. What establishes this, with little room for doubt, is that Raimund Lullius,\* a Castilian author, writing in 1295 on the *arte de navegar*, describes such an instrument as one of those in use among mariners.

Without entering into details at once unnecessary and unpopular, this apparatus may be described as the modest progenitor of our quadrant and sextant. It enabled the observer on land to determine, with tolerable accuracy, the altitude of the heavenly bodies; for this purpose it had long been in familiar use among the Arabians. "An observatory, in the gardens of the Caliph of Bagdad, contained a quadrant of fifteen cubits in radius and a sextant of forty," while at Samarcand instruments of even greater size were employed.

The Arabians, moreover, we have good reason to suppose, had advanced beyond the mere terrestrial use of this apparatus. The geographer Edrisi, an Arabian, born at Ceuta, in Africa, in 1099, gives in his Geography a description of the Azore Islands, under the name of Hawk or Vulture Islands. It is altogether likely that some of the miscreant navigators had made their way to the islands in question. Possibly the cross-staff, but more probably the astrolabe, had given them the triple casing of brass, which Horace deemed requisite to fortify the adventurous seaman's heart.

As used by the Arabians, however, and introduced by them among the Castilians, the astrolabe did not, and could not, altogether justify its somewhat pretentious title of star-catcher. Sometimes the stars refused to be caught,

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\* See Humboldt, *Krit. Unters.*, i, 235.



and were not in the field when they should have been meekly captured. Such was the construction of the astrolabe that its accuracy depended on the stillness of itself and the observer. Its action was least unsatisfactory when it was suspended from an immovable support. Without much difficulty, therefore, can we appreciate the fact that if such an instrument were affixed to the mast of a moving vessel, the maximum of steadiness and the consequent minimum of error could scarcely be expected. For let us imagine the situation and efforts of an observer on a vessel in a moderately stormy sea. The night is clear, but the waves run high. The craft of the mariner is executing a movement too impressive in its effects upon the delicate human organization to pass from memory or to need description here. What is its influence upon the should-be taker of stars? Those brilliant points, that seem so imperturbably calm, so unutterably dignified, as well-nigh to exclude the idea that they move, are executing a veritable fandango. Not unfairly may even the stars called fixed be stigmatized as *ignes fatui*. Each plunge of the vessel gives them a different apparent altitude. Now they are exalted above, now depressed below their true position, and the perplexed observer has almost to guess where his horizon is, and where the star whose height above that horizon he fondly hopes to determine.

In describing the experiences of Vasco de Gama in his passage round the Cape of Good Hope, Barros quotes, from Pigafetta, an amusing account, which aptly illustrates the inconvenience which that ancient mariner experienced from the cause under consideration. De Gama reaches the Bay of St. Helena, on the coast of Africa, and makes a landing there, partly, said Barros, for the purpose of getting a supply of water, but partly, also, with the idea of getting an accurate determination of the altitude of the sun. "For," he says, in explanation of so singular, so amphibious, a piece of seamanship,

“the Portuguese had only a short time before this availed themselves of the astrolabe in navigation; and the ships of Vasco were small, so that, on account of their plunging, he could place no reliance upon observations made on board.” The instrument, therefore, was but poorly adapted to the purposes of the mariner. Regiomontanus well understood its defects, and, in his workshop at Nuremberg, applied himself to its improvement; and what is specially to our present purpose, on turning to the earlier history of M. Behaim, we find that worthy acquiring from the master-spirit of Johann Müller a knowledge of the theory and practice of the astronomy of his age. This is an epoch in Martin’s career. In the workshop-study of Regiomontanus is laid the foundation of his after-notoriety.

But the cultivation of science is, alas! not so lucrative as the sale of English and Flemish cloths, which has served hitherto to replenish the family-exchequer; and the fortunes of Martin require that he shall devote himself to the bread-and-butter sciences. To prosecute this not so noble but more needful vocation, he betakes himself to the preëminently commercial kingdom of Portugal. Here he at once achieves distinction as the pupil of Regiomontanus, a mathematician himself of no mean skill, and in course of time he holds rank second to none among the promoters of geographical investigation. Let us see how he attains it. All maritime Europe (Venice alone excepted) was anxious, at the time when Martin betook himself to Portugal, to discover a pathway by sea to the East Indies. For a period of about sixty years Portugal had been conspicuously active in her efforts in this direction. The general method of her discoverers had been to attempt the circumnavigation of Africa. Progress, however, was slow, and we may, perhaps, not unfairly conclude, from the facts in the case, that they were not altogether unprepared to try some other more promising plan. We reach this conclusion from a very

interesting piece of history already alluded to. It was as follows: In 1474, the Canon Fernando Martinez, under instructions from his majesty Alphonzo the Fifth (then sovereign of Portugal), addressed a letter to the too little celebrated Italian philosopher Toscanelli, to ascertain his views in regard to a seaward passage to the Indies. Under date Florence, June 25, 1474, Toscanelli writes, "Although I have frequently discussed the advantages which this course" (of sailing westward) "must of necessity present, yet, inasmuch as his majesty expressly requests it, I will again enter into a detailed explanation of it." He then refers to an inclosed chart, whereon he has indicated the proposed course and marked the islands (many of them, doubtless, Marco Polo's imaginary ones) at which the voyager can conveniently land. In a letter addressed at the same time to Columbus, and referring to the plan which he has proposed to King Alphonso, he observes that it is far less difficult than is usually supposed. "On the contrary," he urges, "the chart inclosed demonstrates that the transit from the west coast of Europe to the Indies can be successfully accomplished by the course which I have indicated." Toscanelli was, of course, right, if we substitute America for Cathay, and the West for the East Indies.

To carry out, however, the plan which he had thus suggested to the somewhat discouraged Portuguese, something more than a clearly-drawn and accurate chart was required. The navigator who should follow the sailing directions of Toscanelli must be possessed of some trustworthy means of ascertaining his position at sea. True, the considerate philosopher had indicated on his chart certain insular resting places where the voyager, if distrustful of the accuracy of his instruments, could, like Vasco de Gama, land, and, under pretext of taking water, take also the sun; but who could fix with any degree of certainty the distances of those islands one from another,—nay, worse

than this, who could even give solid assurance of their bare existence?

As far, indeed, as the Azores and Madeira, a distance of about 1,500 miles, the course was not unfamiliar to the Portuguese ship-masters. On the contrary, a commerce of no inconsiderable magnitude was constantly being carried on between these islands and the mother country. As early as 1419 the vine had been transplanted from Cypress to the islands of Porto Santo and Madeira. In 1449, Prince Henry of Portugal had conducted a colony of Flemings to the Azores. In 1450, forty-two years before the sailing of Columbus from Palos, we find Terceira, one of the group, under the control of a Flemish hereditary governor, while sixteen years later a further accession of Flemish colonists established themselves in the Azores. Thus far, then, the course suggested by Toscanelli was quite familiar to European navigators. But beyond these islands, no unwary mariner, save the long-forgotten Icelandic navigators, had as yet allowed himself to venture. And even in executing the passage to them, the voyager, doubtless, had frequent experience of the unreliability of his instruments, and was led to yearn for some measurer of altitudes that should, more successfully than that which he employed, catch the vagabond stars, and give results equally correct in a stormy or a tranquil sea.

The Portuguese navigators, though discouraged by ill success, were not disposed to abandon their own and their forefathers' plan of reaching India by hugging the coast of Africa, and to adopt Toscanelli's bold suggestion of venturing upon unknown waters, *unless they were first put in possession of some trustworthy means of determining their whereabouts*. To attain this practical object, and thus facilitate the discovery of the seaward passage to India, John the First of Portugal organized a royal commission, composed of the ablest mathematicians and geographers in his kingdom. Of this associa-

tion, the most conspicuous and efficient member was our worthy friend, Martin Behaim. Not in vain had he watched the processes by which the grand master Regiomontanus, in the workshop at Nuremberg, sought to attain superior accuracy in his instruments. Although probably in use among the Arabian seafarers who had, as I have suggested, made their adventurous way from the ports of Western Europe, or of Northern Africa, to the Azores, and although, as appears from the testimony of Raimund Lullius, one of the instruments used by Castilian navigators in 1295, nevertheless the famous astrolabe seems to have been entirely forgotten or to have been designedly laid aside. Explain it as we may, the fact of its disuse appears well-nigh indisputable; for Barros, in giving the account, already quoted, of Vasco de Gama's experience, prefaces what he has to say by observing that the Portuguese had only a short time before the date of De Gama's voyage availed themselves of the use of the astrolabe for the purposes of navigation. Now, the royal association of mathematicians, of which Behaim seems to have been not alone a prominent member, but the *factotum*, is credited, by all who have written on the subject, with having introduced this instrument to the notice of the Portuguese.

What the influence of this event upon maritime discovery was, is strikingly suggested by a singular historical coincidence.

From the extant letters of Toscanelli to Columbus, bearing date 1474, it is clear that as early as that date Columbus was thinking of putting the theory of Toscanelli to a practical test. But no proposition is made by Columbus to carry out his desire and try the unknown deep until about 1483. When we bear in mind the profound anxiety felt throughout maritime Europe, and particularly in Spain and Portugal, about the seaward passage to India, the delay of Columbus appears very extraordinary. The question forces itself upon us, why did Columbus, knowing that

every commercial nation of the day was putting forth its utmost effort to secure the benefits expected from the discovery of the seaward passage, postpone for about ten years informing the Portuguese sovereign that he was prepared to carry out Toscanelli's views?

It certainly appears not very unreasonable to conjecture that Columbus did not, up to the date of 1483, feel himself fully prepared to do this. And, furthermore, it does not appear very unreasonable, but the reverse, to conjecture that the thing which induced him to make his proposition at all was that Martin Behaim and his colleagues put into his possession a means of ascertaining a vessel's position at sea, which hitherto was unknown to him. About 1483, probably as early as 1481, the royal commission was organized; in 1483 Columbus offers to undertake his voyage. The coincidence is not devoid of significance.

It strongly suggests that, indirectly, our Martin exercised no inconsiderable influence in bringing about the discovery of America, and otherwise furthering nautical investigation.

This conclusion receives corroboration from the fact that Vespucci, a companion of Columbus, has left it on record that he owed it to the astrolabe that he had been able to direct his course upon the ocean. If the friend of Columbus employed the instrument, we are not altogether unwarranted in concluding that Columbus himself was not unacquainted with its value.

We are in the habit of glorifying the heroism of the navigators who have ventured upon the untried waters in search of unknown lands. Columbus, Vasco de Gama, Cabot, Magellan are all heroes of nautical and geographical history. It is well! Yet, perhaps, there are other some who should have their meed of glory. Small is the justice done to the quiet, thoughtful men of science, like Toscanelli, Regiomontanus, and Behaim, whose labors actually rendered possible the achievements of the heroes

aforesaid, and stripped their voyages of almost everything resembling extraordinary hazard ; who distinctly projected the mariner's course for him, upon charts (with some imaginary items of geographical science, it must be confessed, but still, in the main, with remarkable truth) ; and whose instruments and almanacs, the results of patient labor and profound calculation, enabled him to follow the indicated course with undeviating accuracy.

It should furthermore be remembered, in awarding the meed of merit, that the men of science wrought with nobler aim than did the men of the sea. Mediæval voyages of discovery were eminently speculative in their character. Every mariner expected to reach the Indies. His vessel should plough the waters which rolled upon golden shores ; pearls and gems should freight his returning craft ; and, more than this, annual tribute of all the treasures of Eastern luxury should make his revenue more than princely. Columbus, with inflexible tenacity, insisted that he should be viceroy of all lands discovered by him, and should have a large proportion of the profits of every species of traffic that should be carried on between those lands and Portugal. Magellan made similar judicious stipulations. Verily was there somewhat of the sublunary and the carnal in the heroism of these ancient mariners.

All glory, say we, to those men, who, if they were not actually engaged in the work of discovery, yet made it possible for others of inferior ability to accomplish that work ; who resemble the artist, when, having detected in the shapeless stone a form of life and beauty, he leaves it to a rude artisan to develop what his dull thought could not possibly have devised.

#### ACTUAL DISCOVERIES.

The question naturally occurs whether Martin, having thus rendered signal aid to the geographical researches of

others, ever *directly* engaged in the work of discovery. He did. Circumstantial evidence, of a very strong character, leads to the belief that he was actually the discoverer of the straits called after Magellan. The facts in the case are these: Herrera, a celebrated Spanish historian of the sixteenth century, narrates that when Magellan made application to the Spaniards for means to carry out his plan of reaching India by sailing westward, he asserted that he felt confident of finding a strait which would conduct him through the newly discovered continent of America, and thus to the pearly shores of India and Cathay. The alleged ground of his confidence was that he had seen such a strait depicted upon a chart made by the distinguished navigator Martin Behaim. Herrera wrote in 1596, only seventy-five years after the return of the surviving companions of Magellan, so that it is not at all unlikely that he may have derived his information directly from some one who took part in the expedition. What, however, so augments the probability of Martin Behaim's having discovered the strait as to render it a moral certainty, is the statement of Pigafetta. Pigafetta, it will be remembered, was a nobleman of Vicenza, who accompanied Magellan and kept a diary of the adventures of the expedition. This composition is unfortunately, as the sailors would say, gone to Davy Jones's locker.

In response, however, to a request from Pope Clement VII, Pigafetta prepared a brief narrative of the expedition, and this still tells its tale. It is preserved in MS. in the Ambrosian Library at Milan. Now, what light does Pigafetta throw upon the question under discussion?

Under date October 21st, 1520, he writes: "We discovered a strait to which we gave the name of the Eleven Thousand Virgins, to whom that day was sacred. This strait is 110 miles long; and sometimes more, sometimes less, than half a mile wide. It opens into another sea which we named the 'Still.' But for the knowledge of



our leader we certainly should have found no outlet to this strait, for we all believed that at the other end it was closed. Our commander, however, knew that he could steer through by following a channel of considerable intricacy, which channel he had seen represented upon a chart that is preserved in the royal treasury of Portugal, and constructed by the celebrated Martin Behaim."

Additional confirmation is given to the idea that our hero was the discoverer of the strait in question, by the fact that for a considerable period it actually bore his name.

In 1561, just forty years after the return of the relics of Magellan's expedition, William Postel, a writer of so much character as to have been expelled from the order of the Jesuits, and to have been persecuted by the Inquisition, wrote a compendium of geographical instruction. Therein he informs his readers that the New World is continuous from pole to pole, save where it is severed at the fifty-fifth degree beyond the equator by *the strait of Martin Behaim*.

Taking all the evidence into consideration, it would seem that the facts in the case not simply allow, but compel, us to regard Martin as the original discoverer of the strait.

In another and even more important field, Martin Behaim contributed, by personal exertion, to the advancement of geographical investigation. It has already been suggested that of the two proposed plans for reaching India by sea, that by sailing perpetually westward and that by circumnavigating Africa, the Portuguese were specially enamored of the latter. Their preference had strong ground of support. It was matter of history that Phœnician navigators, in the service of Pharaoh Necho, had performed the feat. To those accustomed to ocean-telegraphs and steam-freights it may not be uninteresting to note the style of navigation indulged in by these ancient men of the sea. Herodotus says they

sailed out of the Red Sea and pursued a southerly course. At the close of the year they landed, cultivated a suitable portion of ground, waited for the harvest, gathered the fruits of their agricultural efforts, and proceeded on their way. At the end of four years they passed through the Pillars of Hercules, and so through the Mediterranean Sea back to Egypt once more. It was, therefore, matter of fact that the circumnavigation of the African continent could be accomplished.

Owing, however, to want of skill or courage, or perhaps to want of sufficiently reliable instruments of observation, the progress made by the Portuguese was exceedingly slow. Perseverance, nevertheless, was not deficient. Successive expeditions were sent out, with instructions to explore the western coast of the continent as far as possible. The possibilities in the case were usually very limited, until, in 1441, a novel impulse was given to the exploring energy of the Portuguese. In that year Tristano Nano proceeded as far south as Cabo Branco. His fame, however, does not rest altogether upon this achievement. He added to his nautical reputation the somewhat questionable distinction of having been the first to bring marketable negroes into Portugal. This invoice appears to have stimulated the spirit of geographical enterprise not a little. The dusky cargo of Tristano was the first-fruits of a goodly harvest, in whose yield our noble mariners and self-denying discoverers would fain participate.

Accordingly, other navigators are employed, and other expeditions deplete the royal treasury, and occasion disloyal sentiments to be felt, if not uttered, respecting the methods adopted to replenish the national exchequer. The work goes on; Cadarnosto reaches the mouth of the Rio Grande. Prince Henry, surnamed the Navigator, from his large capacity for spending money in the prosecution of geographical enterprise, ceases to voyage upon the tempestuous sea of mortal existence, yet the ardor

for nautical adventure is unquenched. The work has its reward.

Already, in 1469, after a lapse of only thirty years, a lucrative trade has been established in negro slaves and other indigenous products, more or less valuable. Fortunate Portuguese! The national conscience is endowed with elasticity proportioned to the expansion of the national exchequer.

The profits accruing are so considerable that Alphonso, the Most Christian King of Portugal, farms out the darksome traffic to Fernando Gomez, and, in addition to pecuniary tribute, exacts as a condition of the monopoly that the said Gomez shall carry on explorations every year 100 leagues farther down the African coast. Fernando is faithful to his engagement, and becomes an illustrious contributor to geographical science. His expedition crosses the line and brings back important information, most encouraging to future explorers. He has ascertained that the heat experienced in equatorial regions is not sufficient to ignite ships like so much tinder, and that specimens of the Caucasian race are not at once transmuted by it into negroes.

The removal of these apprehensions, which had, perhaps, deterred preceding adventurers from proceeding so far to the southward, deserves honorable mention among contributions to practical science; and we are at a loss which to commend more highly, the sagacity of Alphonso who stipulated that 100 leagues of progress in the circumnavigation of Africa should yearly be made, or the honesty, and, withal, courage, of Gomez, who adhered to his bargain, and carried out the stipulation. However we decide this point, the fact remains that the experience of Gomez greatly emboldened future navigators.

Not alone by his correction of geographical errors, and the removal of unfounded nautical fears, however, did Gomez contribute to the advancement of truth. That

meritorious captain had experience which falls not, alas! to the lot of every man; viz., that virtue brings its own reward. In the regions of heat, whither he ventured in fulfilment of his bargain with Alphonso, he found gold-dust and ivory. These alone might have proved no contemptible amelioration of the hardships which his integrity had led him to encounter; but they were not the only mitigation of his perils. The incorruptible Gomez found negroes, also; and, with the same intensely conscientious desire for their conversion to Christianity which stimulated the worthy forefathers of New England to wage war upon the Indians and enslave them, mingled, perhaps, with a vague impression that they had a certain market-value, the Portuguese navigators, for the greater glory of God, and the salvation of the souls of the negroes, possessed themselves of a cargo of their bodies.

Gomez had done a good work. Whether the glory of God was particularly advanced, or the souls of the dusky savages specially advantaged by the corporal toil to which they were subjected, it is not the time now to inquire.

Certain it is that the valuable returns, secured by Gomez in his progress down the African coast, must have had an effect, upon the work of exploration, of a highly stimulating nature. Fears were dispelled; bright, not to say dazzling, expectations were created by his very successful voyage as far as Cape Santa Catharina, a few degrees below the equator.

The Portuguese are encouraged to prosecute the effort to circumnavigate Africa, rather than attempt the plan suggested by Toscanelli, and now proposed afresh by Columbus. Accordingly, in 1484, 1485, 1486, two expeditions appear to have been sent out, under command of Diogo Cano, but under the scientific direction of Martin Behaim, who held the position of astronomer and cosmographer to the expedition. Under Martin's guidance, decided progress is made. The achievements

of Gomez himself are surpassed ; the equator and Santa Catharina are left far to the north, and on the first voyage the eighth degree of south latitude is reached ; on the second, the twenty-second degree. In other words, the voyagers proceed about 1,500 miles further than their predecessors. In token of the success thus attained, a pillar of stone is erected upon the shore, bearing upon it the royal arms of Portugal. On his return to Portugal, in 1486, Behaim is treated with marked distinction. He is made Knight of the Order of Christ, the king himself girds on his sword, the crown prince buckles on his spur.

And there was justice in this. Progress of the most important kind had been made. These two voyages of Behaim and his companion were grand steps in the solution of the grand commercial and geographical problem occupying the attention of European savans and statesmen.

In making this statement we are justified by historic fact. The voyage of Bartholomew Diaz, which resulted in the discovery of the Cape of Good Hope, was evidently suggested by the success achieved by Diogo and Behaim. Bartholomew Diaz is despatched, without loss of time, immediately upon the return of the former expedition. He follows so closely in their wake, that he takes with him, as guides, some negroes whom Behaim and his companion had carried home to be christianized. Not unfairly, then, may we assign to Behaim a conspicuous position among those who carried forward, through personal energy and hardship, the work of exploration in the fifteenth century. It is to be considered that what he accomplished so bore upon the final triumph of Vasco de Gama as to be justly entitled the beginning of the end.

And when we recollect that the end in question was the resolution of a geographical problem which, in an unparalleled manner, has influenced the destinies of the world ; when we reflect that the final consequences of the resolu-

tion of that problem were the temporary transfer of the East India trade to Portugal ; the final destruction of the monopoly long enjoyed by Venice, and the opening of Oriental traffic to the competition of all maritime Europe ; the removal of the seat of commercial and political power from the shores of the Mediterranean to the Atlantic coasts ; the enrichment of Holland and England ; the investing of these Teutonic nations with naval and commercial supremacy and political predominance ; the development of the ideas of political and intellectual freedom which conspicuously belong to those nations ;—when we bear all this in mind, then, I say, as Anglo-Saxons, as determined enemies of monopoly in thought or in merchandise alike, as strenuous upholders of systems which afford an opportunity to every man's enterprise, we shall feel abundantly willing to render honor to one who prominently shared in bringing about the magnificent result alluded to.

As a geographer, then, who by his globe gives us accurate information as to the state of geographical science in 1492 ; as one who, indirectly and directly, exerted no inconsiderable influence in advancing that science, I invite you this evening to do honor to Martin Behaim, of Nuremberg.